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Old forces to create new materials

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Enabling and understanding new methodologies to fabricate molecular assemblies driven by intermolecular interactions is fundamental in chemistry. Such forces can be used to control crystal growth and enable surface-confinement of these materials, which remains challenging. In the 1960s, the late Gerhard M. J. Schmidt from the Weizmann Institute of Science discovered that some molecules are unusually closely arranged in organic crystals. This spatial arrangement turned out to be a result of an unexplored weak intermolecular interaction, termed "halogen bonding" many years later by other scientists. Such interactions play a key role in organic processes (in a cell or organism) that are necessary for sustaining life. For example, thyroid hormones use halogen bonding to bind to receptors in order to regulate the development, growth and metabolism of the cells in our body. We demonstrate a solvent-free on-surface crystal-to-co-crystal conversion process driven by halogen bonding (XB). By exposing a polycrystalline organic material, consisting of a XB-acceptor moiety, to the vapors of a complementary XB-donor compound, the corresponding halogen-bonded co-crystals were formed. Furthermore, we show that this approach can also be utilized for non-crystalline materials to afford surface-confined organic composites. Our stepwise vapor-based approach offers a new strategy for the formation of hybrid supramolecular materials.

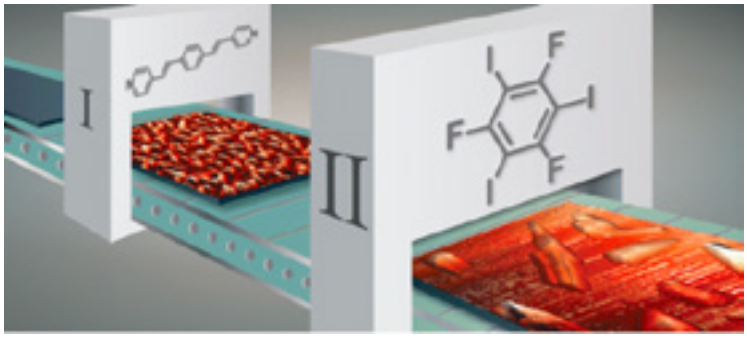

Figure-1: Consecutive formation of halogen bonded crystals.

Biography

Milko E van der Boom has completed his BSc in Chemical Engineering at the Amsterdam University of Applied Sciences and his MSc degree in Inorganic Chemistry at the University of Amsterdam. In 1994, he was enrolled as a Doctoral student at the Weizmann Institute of Science, where he studied Organometallic Chemistry and was awarded his PhD degree with distinction in 1999. After three years of Postdoctoral work at Northwestern University, where he studied the formation of functional organic films, he returned to the Weizmann Institute's Department of Organic Chemistry in 2002. His interdisciplinary materials chemistry research focuses on metalloorganic-oriented synthetic and mechanistic studies. His prizes and honors include an Alon Fellowship from the Israel Council for Higher Education.

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